

U.S.S.N. 10/656,586

Remarks

Thorough examination by the Examiner is noted and appreciated.

The claims have been amended to further clarify Applicants disclosed and claimed invention and define over the prior art.

No new matter has been added.

For example, support for the amendments is found in the originally and previously presented claims, the Figures, and in Specification e.g.:

[0019] In accordance with these and other objects and advantages, the present invention is generally directed to a novel embedded fastener apparatus and method for fastening components to the **interior of a process chamber of a semiconductor fabrication apparatus**. In one embodiment, the invention includes an apparatus having a showerhead or gas distribution plate which is mounted to the interior of the process chamber using multiple fasteners which are embedded in respective fastener openings in the showerhead. In another embodiment, the invention includes an apparatus having a showerhead which is mounted to the interior of the process chamber using multiple exterior fasteners which extend into the showerhead through the walls of the process chamber. Accordingly, the regions of the showerhead which surround the fasteners **are physically separated from the interior of the process chamber**. Consequently, **accumulation of particles inside the process chamber due to thermal-induced damage of the showerhead in the areas surrounding the fastener is eliminated or significantly reduced**.

U.S.S.N. 10/656,586

[0033] It will be appreciated from a consideration of FIG. 2 that each showerhead fastener opening 54 in the showerhead 44 is substantially sealed off from the chamber interior 42 by abutment of the showerhead 44 against the chamber wall 38. Consequently, the exterior fasteners 56 extend into the showerhead 44 in such a manner that each of the exterior fasteners 56, as well as the regions of the showerhead 44 which contact the exterior fasteners 56, is substantially isolated from the chamber interior 42 in which processing of the wafer 50 is carried out. **Accordingly, particles generated by friction between the showerhead 44 and the threaded shank 60, induced by thermal expansion and contraction cycling of the showerhead 44 during processing, are incapable of inadvertently falling into the chamber interior 42 and contaminating a wafer 50 being processed therein.**

PREMATURE FINALITY

Applicants respectfully request Examiner to WITHDRAW THE FINALITY OF THE ACTION. Applicants' note that Examiner has made final the most recent office action on new grounds of rejection, relying on prior art not of record (Graves). Applicant's previous amendments neither necessitated Examiners new grounds of rejection nor required the newly cited art (see MPEP 706.07(a)). For example, the previous amendments were made to overcome rejections under section 112. Indeed, the fact that Examiner has maintained his previous 102(a) rejection over previously cited art and has now added a new 102(a) rejection including the Graves reference shows that Applicants amendments did not necessitate application of the new cited reference including new grounds of rejection.

Applicants reproduce relevant portions of the MPEP concerning

U.S.S.N. 10/656,586

FINALITY OF OFFICE ACTIONS:

MPEP 706.07

Before final rejection is in order a clear issue should be developed between the examiner and applicant. To bring the prosecution to as speedy conclusion as possible and at the same time to deal justly by both the applicant and the public, the invention as disclosed and claimed should be thoroughly searched in the first action and the references fully applied; and in reply to this action the applicant should amend with a view to avoiding all the grounds of rejection and objection. Switching from one subject matter to another in the claims presented by applicant in successive amendments, or from one set of references to another by the examiner in rejecting in successive actions claims of substantially the same subject matter, will alike tend to defeat attaining the goal of reaching a clearly defined issue for an early termination, i.e., either an allowance of the application or a final rejection.

The applicant who is seeking to define his or her invention in claims that will give him or her the patent protection to which he or she is justly entitled should receive the cooperation of the examiner to that end, and not be prematurely cut off in the prosecution of his or her application.

706.07(a) Final Rejection, When Proper on Second Action

Under present practice, second or any subsequent actions on the merits shall be final, except where the examiner introduces a new ground of rejection that is neither necessitated by applicant's amendment of the claims nor based on information submitted in an information disclosure statement filed during the period set forth in 37 CFR 1.97(c) with the fee set

U.S.S.N. 10/656,586

forth in 37 CFR 1.17(p). Where information is submitted

A second or any subsequent action on the merits in any application or patent involved in reexamination proceedings **should not be made final if it includes a rejection, on prior art not of record, of any claim amended to include limitations which should reasonably have been expected to be claimed.** See MPEP § 904 *et seq.* For example, one would reasonably expect that a rejection under 35 U.S.C. 112 for the reason of incompleteness would be replied to by an amendment supplying the omitted element.

Thus, Applicants amendments to overcome 112 rejections included no new subject matter **which could not have been reasonably expected.** Indeed, the fact that Examiner has maintained his previous 103(a) rejection over previously cited art shows that Applicants previous amendments did not necessitate Examiners application of new art and new ground of rejection.

Applicants therefore, respectfully request Examiner withdraw the Finality of the most recent action to give Applicants an ample opportunity to distinguish their invention over the newly cited art, as they are entitled to do.

Claim Rejections under 35 USC 103

1. Claims 1, 2, 21-28, and 31-34 stand rejected under 35 USC

U.S.S.N. 10/656,586

103(a), as being unpatentable over Masuda et al. (US PUB 2002/0000197) in view of Ohta (US 4,526,132).

Examiner asserts that Masuda et al. teaches a processing chamber having a lateral surface engaging the chamber wall (and refers to **entire document**).

Masuda et al. show a schematic representation of a showerhead 12 Figure 2 that is only described as "having small holes so that the raw material gas introduced into the gas storing chamber 18 passes through the small holes of the shower plate 12 and sprayed into the reactor chamber" (see paragraph 0088, 0111, 0121).

Masuda et al. nowhere suggests or discloses how the showerhead 12 is installed. Masuda et al. nowhere describes that the showerhead engages the chamber wall or if a confinement structure is used to direct the gas from the gas storage space 18 through the showerhead. In any event, assuming *arguendo* that one may speculate from the schematic shown in Masuda et al. that the **showerhead engages the chamber wall**, which Applicants do not concede, Masuda et al. nowhere suggests or discloses how the showerhead 12 is installed, or if there is some other structure that directs gas from the gas storage space 18 through the

U.S.S.N. 10/656,586

showerhead.

Masuda et al. nowhere recognize or suggest the problem that Applicants have recognized and solved by their disclosed and claimed invention:

"An apparatus to reduce particle contamination to a semiconductor device process chamber interior by thermal cycling of fasteners"

Or disclose or suggest:

"a plurality of exterior fasteners extending through said chamber wall and into said showerhead, with an exterior of said plurality of exterior fasteners physically separated from said chamber interior to prevent said particle contamination."

In contrast, Ohta discloses a discharger 37 mounted on a flange 39 (see Figure 2, 3 and 4) where holes 51 are provided so that a screwing bolt 52 can be screwed through the hole (col 3, lines 55-60; col 4; lines 12-23), i.e., the bolt 52 **does not extend through the chamber wall (see Figure 3).**

U.S.S.N. 10/656,586

Thus, even assuming *arguendo*, a proper motivation for combining the teachings of Ohta and Masuda et al., attaching the showerhead of Masuda et al. with the flange bolts and holes of Ohta would not produce Applicants invention. It is noted that there is no suggestion that the flange and bolts of Ohta could be successfully used to mount the showerhead of Masuda et al.

Examiner argues that "Ohta teaches that two parts can be connected together by passing a screw through an outer piece into an inner piece". However, such teaching used to modify Masuda et al. **does not produce what Applicants claim.** Examiner argues without support that "one of ordinary skill would know to pass a screw through the chamber wall and into the showerhead to secure the showerhead of Matsuda et al. as taught by Ohta. The idea of attaching two parts with a screw is *prima facie* obvious". Thus Examiner ignores the teaching of Ohta who nowhere teaches extending a fastener through chamber wall to secure a structure within the chamber as well as ignoring the elements of Applicants invention:

"a plurality of exterior fasteners extending through said chamber wall and into said showerhead, with an exterior of said plurality of exterior fasteners physically separated from said chamber interior to prevent said particle contamination."

U.S.S.N. 10/656,586

Examiner has further failed to show in either reference a recognition of the problem, or a solution thereto, that Applicants have recognized and solved by their invention:

"An apparatus to reduce particle contamination to a semiconductor device process chamber interior by thermal cycling of fasteners"

Thus, the combination of Masuda et al. and Ohta fail to suggest or disclose several elements of Applicants invention including those elements in **bold type**:

"An apparatus to reduce particle contamination to a semiconductor device process chamber interior by thermal cycling of fasteners comprising:

a process chamber having a substantially vertical chamber wall defining a chamber interior;

a showerhead provided in said process chamber and **having a lateral surface engaging said chamber wall; and**

a plurality of exterior fasteners extending through said

U.S.S.N. 10/656,586

chamber wall and into said showerhead, with an exterior of said plurality of exterior fasteners physically separated from said chamber interior to prevent said particle contamination."

"First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

"A prior art reference must be considered in its entirety, i.e., as a whole including portions that would lead away from the claimed invention." *W.L. Gore & Associates, Inc., Garlock, Inc.*, 721 F.2d, 1540, 220 USPQ 303 (Fed Cir. 1983), cert denied, 469 U.S. 851 (1984).

"Finally, when evaluating the scope of a claim, every limitation in the claim must be considered. Office personnel may

U.S.S.N. 10/656,586

not dissect a claimed invention into discrete elements and then evaluate the elements in isolation. Instead, the claim as a whole must be considered." See, e.g., *Diamond v. Diehr*, 450 U.S. at 188-189, 209 USPQ at 9.

2. Claims 3, 5, 29, 30, 35 and 36 stand rejected under 35 USC 103(a), as being unpatentable over Masuda et al. in view of Ohta, above, and further in view of Lilleland et al. (US 6,073,577).

Applicants reiterate the comments made above with respect to Masuda et al. in view of Ohta.

Even assuming *arguendo* a proper motivation for combination, the fact that Lilleland et al. disclose a showerhead electrode (10) and one or more baffle plates (22) above the showerhead electrode (10) and a confinement ring (17) (Figure 1), and nowhere suggests or disclose how the showerhead electrode or showerhead electrode assembly is mounted in a process chamber, does not further help Examiner in producing Applicants invention.

In addition, it is noted that modifying Masuda et al. with the confinement ring of Lilleland et al. would ensure that the showerhead of Masuda et al. does not engage the reactor walls, as the confinement ring of Lilleland et al. engages the chamber

U.S.S.N. 10/656,586

walls (see col 2, lines 49-54) rather than the showerhead electrode 10 of Lilleland et al., thus further ensuring that such modification does not produce Applicants invention.

"First, there must be some **suggestion or motivation**, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. **Second**, there must be a **reasonable expectation of success**. **Finally**, the prior art reference (or references when combined) **must teach or suggest all the claim limitations**. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

A prior art reference must be considered in its entirety, i.e., as a whole including portions that would lead away from the claimed invention." *W.L. Gore & Associates, Inc., Garlock, Inc.*, 721 F.2d, 1540, 220 USPQ 303 (Fed Cir. 1983), cert denied, 469 U.S. 851 (1984).

3. Claims 1, 2, 21-28, and 31-34 stand rejected under 35 USC 103(a), as being unpatentable over Masuda et al., above, in view

U.S.S.N. 10/656,586

of Graves (4,331,352) and Ohta, above.

Applicants reiterate the comments made above with respect to Masuda et al. and Ohta.

In non-analogous art, Graves discloses a structure for supporting and constraining opposed members of a heat exchange frame where high temperature portions of the heat exchanger are thermally isolated from the frame. Examiner refers to Figure 5, where Examiner erroneously identifies 30b as a chamber wall, and erroneously asserts that graves teaches "attaching interior part 28b to the chamber 30b with lateral screws having a fastener head that engages the outer surface of the chamber and a threaded shank that pass through the chamber wall and into a threaded opening in the interior part 28b". Rather 30b is a manhole cover for a heat exchanger core 12 (see col 4, lines 39-55; Figure 2) and 28b is a manway flange. Figure 5 shows a support arrangement 60 for supporting the manway flange 28b while accommodating thermal growth from the longitudinal expansion of the tie rods 36 (col 5 line 676-col 6, line 15). In Figure 5, Graves shows a support pin 62 mounted in frame member 62, where the support pin extends through a slotted extension 66 in the manway flange, to allow the manway flange to expand outwardly to the left upon thermal expansion (col 6, lines 3-9).

U.S.S.N. 10/656,586

Thus, the mounting pin 62 connected a frame member 64 to the manway flange 28b through a slotted extension 66 which is **exterior to the housing 70 of the heat exchanger** (col 6, lines 16-21. Figure 2) **to allow sliding movement of the mounting flange along the guide pin 62 upon thermal expansion of the frame** (see **Abstract; see col 6, lines 5-9**). Note that the pins 62 are **exposed** where the sliding movement would cause particle contamination, thus creating the very problem that Applicants invention recognizes and solves.

Nevertheless, modifying Masuda et al. with the manway cover 30b and manway flange 28b where the manway flange 28b is attached to the frame member 64 through slotted extension 66 (on the manway flange) by the mounting pin 62 **(to allow sliding movement of the mounting flange along the guide pin 62 upon thermal expansion of the frame)** , even if this were somehow possible without destroying the showerhead of Masuda et al. and **making it unsuitable for its intended purpose**, such modification would not produce Applicants invention.

For example, if the showerhead were mounted on pins to allow for sliding engagement of the chamber wall and the showerhead upon thermal expansion, this would ensure that the showerhead did not engage the chamber wall and make it **unsuitable for its**

U.S.S.N. 10/656,586

intended purpose as previously argued by Examiner.

"If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification." *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

Moreover, such modification does not produce the element of Applicants invention including those elements in **bold type**:

"An apparatus to reduce particle contamination to a semiconductor device process chamber interior by thermal cycling of fasteners comprising:

a process chamber having a substantially vertical chamber wall defining a chamber interior;

a showerhead provided in said process chamber and **having a lateral surface engaging said chamber wall**; and

a plurality of exterior fasteners extending through said chamber wall and into said showerhead, with an exterior of said

U.S.S.N. 10/656,586

plurality of exterior fasteners physically separated from said chamber interior to prevent said particle contamination."

"First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

A prior art reference must be considered in its entirety, i.e., as a whole including portions that would lead away from the claimed invention." *W.L. Gore & Associates, Inc., Garlock, Inc.*, 721 F.2d, 1540, 220 USPQ 303 (Fed Cir. 1983), cert denied, 469 U.S. 851 (1984).

Conclusion

U.S.S.N. 10/656,586

The cited references, either individually or in combination, do not produce or suggest Applicants disclosed and claimed invention, and do not recognize or provide a solution to the problem that Applicants have recognized and solved by their invention, and are therefore insufficient to make out a *prima facie* case of obviousness with respect to both Applicants independent and dependent claims.

The Claims have been amended to further clarify Applicants invention. A favorable consideration of Applicants' claims is respectfully requested.

Based on the foregoing, Applicants respectfully submit that the Claims are now in condition for allowance. Such favorable action by the Examiner at an early date is respectfully solicited.

In the event that the present invention as claimed is not in condition for allowance for any reason, the Examiner is respectfully invited to call the Applicants' representative at his Bloomfield Hills, Michigan office at (248) 540-4040 such that necessary action may be taken to place the application in a condition for allowance.

U.S.S.N. 10/656,586

Respectfully submitted,

Tung & Associates



Randy W. Tung

Reg. No. 31,311

Telephone: (248) 540-4040